

Amendments to the claims:

This listing of the claims will replace all prior versions and listings of the claims in the application:

Listing of Claims

1. (Currently amended) A method of forming a capacitor on an integrated circuit comprising:

forming a ~~eylindrical~~ lower electrode of the capacitor on an integrated circuit substrate;

forming a nitride protection layer on the ~~eylindrical~~ lower electrode at a first temperature ~~below a minimum temperature associated with~~ without a phase change of the ~~eylindrical~~ lower electrode and without an increase of a resistance of the lower electrode;

forming a dielectric layer on the nitride protection layer at a second temperature of ~~about 600°C or less~~ substantially the same as the first temperature, wherein the nitride protection layer is configured to ~~limit~~ prevent an oxidation of the ~~eylindrical~~ lower electrode during forming in a formation of the dielectric layer ~~and wherein the nitride protection layer and the cylindrical lower electrode are not exposed to a temperature of above 600°C before formation of the dielectric layer;~~ and

forming an upper electrode of the capacitor on the dielectric layer.

2. (Currently amended) The method of Claim 1, wherein the ~~eylindrical~~ lower electrode comprises an amorphous silicon layer, a polycrystalline silicon layer and/or a composite layer thereof.

3. (Currently amended) The method of Claim 1, wherein the nitride protection layer comprises a silicon nitride layer.

4. (Currently amended) The method of Claim 3, wherein forming the nitride protection layer ~~comprises forming the silicon nitride layer~~ is performed at [[a]] the first

temperature ~~[[of]]~~ below about 600°C ~~or less~~ using a plasma nitration process.

5. (Currently amended) The method of Claim 3, wherein forming the nitride protection layer ~~comprises forming the silicon nitride layer directly on the cylindrical lower electrode~~ is performed at [[a]] the first temperature ~~[[of]]~~ below about 600°C ~~or less~~ using a chemical vapor deposition process ~~and/or~~ or an atomic layer deposition process.

6. (Currently amended) The method of Claim 3, wherein forming the nitride protection layer ~~comprises forming the silicon nitride layer directly on the cylindrical lower electrode~~ is performed at [[a]] the first temperature ~~[[of]]~~ below about 600°C ~~or less~~ using a microwave-type deposition process.

7. (Currently amended) The method of Claim 1, wherein the dielectric layer comprises a metal oxide layer.

8. (Currently amended) The method of Claim 7, wherein the metal oxide layer comprises a TiO₂ layer, an Al₂O₃ layer, an Y₂O₃ layer, a ZrO₂ layer, an HfO₂ layer, a BaTiO₃ layer, an SrTiO₃ layer and/or a composite layer thereof.

9. (Currently amended) The method of Claim 7, wherein forming the dielectric layer ~~comprises forming the metal oxide layer~~ is performed at [[a]] the second temperature ~~[[of]]~~ below about 600°C ~~or less~~ using a chemical vapor deposition process ~~and/or~~ or an atomic layer deposition process.

10. (Canceled).

11. (Currently amended) The method of Claim 1, wherein the upper electrode comprises an amorphous silicon layer, a polycrystalline silicon layer, an Ru layer, a Pt layer, an Ir layer, a TiN layer, a TaN layer, a WN layer and/or a composite layer thereof.

12. (Currently amended) The method of Claim 1, wherein forming the ~~eylindrieal~~ lower electrode comprises:

- forming a lower structure on the integrated circuit substrate;
- forming an insulation layer pattern having a contact hole on the lower structure;
- forming a conductive plug in the contact hole;
- forming an oxide layer patterned to have a cylindrical shape on the insulation layer pattern and the conductive plug;
- forming a conductive layer for the ~~eylindrieal~~ lower electrode on the oxide layer; and
- removing the oxide layer to form the ~~eylindrieal~~ lower electrode having a cylindrical shape.

13. (Currently amended) The method of Claim 12, wherein ~~forming~~ the nitride protection layer ~~comprises forming the nitride protection layer~~ is directly formed on the conductive layer.

14. (Currently amended) A method of forming a capacitor comprising:
forming a first conductive layer on a substrate;
forming a reaction-preventing nitride layer on the first conductive layer at a first temperature without not generating a phase change of the first conductive layer and without an increase of a resistance of the first conductive layer to prevent oxidation of the first conductive layer;

- forming a dielectric layer on the reaction-preventing nitride layer at ~~[[the]]~~ a second temperature not generating the phase change of the first conductive layer substantially the same as the first temperature, wherein the reaction-preventing nitride layer prevents an oxidation of the first conductive layer in a formation of the dielectric layer and the first conductive layer are not exposed to a temperature generating the phase change of the first conductive layer before formation of the dielectric layer; and

- forming a second conductive layer on the dielectric layer.

15. (Currently amended) The method of Claim 14, wherein the first conductive layer ~~[[is]]~~ comprises an amorphous silicon layer, a polycrystalline silicon layer and/or a composite layer thereof.

16. (Currently amended) The method of Claim 14, wherein the reaction-preventing nitride layer ~~[[is]]~~ comprises a silicon nitride layer.

17. (Currently amended) The method of Claim 16, wherein the ~~silicon~~ reaction-preventing nitride layer is formed by a plasma nitration process at ~~[[a]]~~ the first temperature ~~[[of]]~~ below about 600°C ~~or less~~.

18. (Currently amended) The method of Claim 16, wherein the ~~silicon~~ reaction-preventing nitride layer is formed by a chemical vapor deposition process at ~~[[a]]~~ the first temperature ~~[[of]]~~ below about 600°C ~~or less~~ or by an atomic layer deposition process at ~~[[a]]~~ the first temperature ~~[[of]]~~ below about 600°C ~~or less~~.

19. (Currently amended) The method of Claim 16, wherein the ~~silicon~~ reaction-preventing nitride layer is formed by a microwave-type deposition process at ~~[[a]]~~ the first temperature ~~[[of]]~~ below about 600°C ~~or less~~.

20. (Currently amended) The method of Claim 14, wherein the dielectric layer ~~[[is]]~~ comprises a metal oxide layer.

21. (Currently amended) The method of Claim 20, wherein the metal oxide layer ~~[[is]]~~ comprises at least one selected from the group consisting of a TiO₂ layer, an Al₂O₃ layer, an Y₂O₃ layer, a ZrO₂ layer, an HfO₂ layer, a BaTiO₃ layer, an SrTiO₃ layer and a composite layer thereof.

22. (Currently amended) The method of Claim 20, wherein the ~~metal-oxide~~ dielectric layer is formed by a chemical vapor deposition ~~method~~ process at ~~[[a]] the second~~ temperature ~~[[of]] below~~ about 600°C ~~or less~~ or by an atomic layer deposition ~~method~~ process at ~~[[a]] the second~~ temperature ~~[[of]] below~~ about 600°C ~~or less~~.

23. (Currently amended) The method of Claim 14, wherein the second conductive layer ~~[[is]] comprises~~ an amorphous silicon layer, a polycrystalline silicon layer, a Ru layer, a Pt layer, an Ir layer, a TiN layer, a TaN layer, a WN layer and/or a composite layer thereof.

24. (Currently amended) A method of forming a capacitor comprising:
forming an insulation layer pattern having a contact hole on a substrate having a lower structure;

forming a first conductive layer continuously on a sidewall portion and a bottom portion of the contact hole and on ~~[[the]] a~~ surface portion of the insulation layer pattern;

removing the first conductive layer formed on the surface of the insulation layer pattern;

removing the insulation layer pattern to allow the first conductive layer to remain on the sidewall portion and the bottom portion of the contact hole to form a cylindrical lower electrode;

forming a reaction-preventing nitride layer on the cylindrical lower electrode at a first temperature ~~not generating without~~ a phase change of the cylindrical lower electrode and without an increase of a resistance of the cylindrical lower electrode to prevent oxidation of the cylindrical lower electrode;

forming a dielectric layer on the reaction preventing nitride layer at ~~[[the]] a~~ second temperature ~~not generating the phase change of the first conductive layer~~ substantially the same as the first temperature, wherein the reaction-preventing nitride layer prevents an oxidation of the cylindrical lower electrode in a formation of the dielectric layer and the first conductive layer are not exposed to a temperature generating the phase change of the first conductive layer before formation of the dielectric layer; and

forming a second conductive layer on the dielectric layer as an upper electrode.

25. (Currently amended) The method of Claim 24, wherein the first conductive layer [[is]] comprises an amorphous silicon layer, a polycrystalline silicon layer and/or a composite layer thereof.

26. (Currently amended) The method of Claim 24, wherein the ~~reaction-preventing~~ reaction-preventing layer is formed by a plasma nitration process at [[a]] the first temperature [[of]] below about 600°C ~~or less~~, by a chemical vapor deposition process at [[a]] the first temperature [[of]] below about 600°C ~~or less~~ or by an atomic layer deposition process at [[a]] the first temperature [[of]] below about 600°C ~~or less~~.

27. (Currently amended) The method of Claim 24, wherein the dielectric layer [[is]] comprises at least one selected from the group consisting of a TiO₂ layer, an Al₂O₃ layer, an Y₂O₃ layer, a ZrO₂ layer, an HfO₂ layer, a BaTiO₃ layer, an SrTiO₃ layer and a composite layer thereof.

28. (Currently amended) The method of Claim 24, wherein the dielectric layer is formed by a chemical vapor deposition process at [[a]] the second temperature [[of]] below about 600°C ~~or less~~ or by an atomic layer deposition process at [[a]] the second temperature [[of]] below about 600°C ~~or less~~.

29. (Currently amended) The method of Claim 24, wherein the second conductive layer [[is]] comprises one of an amorphous silicon layer, a polycrystalline silicon layer, an Ru layer, a Pt layer, an Ir layer, a TiN layer, a TaN layer, a WN layer and/or a composite layer thereof.

30. (Currently amended) The method of Claim 24, wherein the lower structure ~~includes~~ comprises a contact plug connected to the cylindrical lower electrode.

31. (Currently amended) The method of Claim 1, wherein the nitride protection layer comprises an electrically non-conductive layer.

32. (Currently amended) A method of forming a capacitor on an integrated circuit comprising:

forming a ~~cylindrical~~ lower electrode of the capacitor on an integrated circuit substrate;

forming an electrically non-conductive protection layer on the ~~cylindrical~~ lower electrode at a first temperature ~~below a minimum temperature associated with~~ without a phase change of the ~~cylindrical~~ lower electrode and without an increase of a resistance of the first lower electrode;

forming a dielectric layer on the electrically non-conductive protection layer at ~~[[the]]~~ a second temperature ~~below the minimum temperature associated with the phase change of the cylindrical lower electrode~~ substantially the same as the first temperature, wherein the electrically non-conductive protection layer is configured to ~~limit~~ prevent an oxidation of the ~~cylindrical~~ lower electrode during forming in a formation of the dielectric layer ~~and wherein the electrically non-conductive protection layer and the cylindrical lower electrode are not exposed to the temperature associated with the phase change of the cylindrical lower electrode before formation of the dielectric layer;~~ and

forming an upper electrode of the capacitor on the dielectric layer.

33. (Currently amended) A method of forming a capacitor on an integrated circuit comprising:

forming a lower electrode of the capacitor on an integrated circuit substrate;

forming a nitride protection layer on the lower electrode at a first temperature ~~below a minimum temperature associated with~~ without a phase change of the lower electrode and without an increase of a resistance of the lower electrode;

forming a dielectric layer on the nitride protection layer at ~~[[the]]~~ a second

In re: Lim et al.
Serial No. 10/629,407
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Page 9 of 11

temperature ~~below the minimum temperature associated with the phase change of the lower electrode~~ substantially the same as the first temperature, wherein the nitride protection layer is configured to ~~limit~~ prevent an oxidation of the lower electrode ~~during forming~~ in a formation of the dielectric layer and ~~wherein the nitride protection layer and the lower electrode are not exposed to the temperature associated with the phase change of the lower electrode before formation of the dielectric layer;~~ and

forming an upper electrode ~~of the capacitor~~ on the dielectric layer.